

ROLE OF MULCHING IN VEGETABLE CROPS

“Mulching is an agricultural cropping technique that involves placing organic or synthetic materials on the soil around plants to provide a more favorable environment for growth and production”. Mulch is any material applied to the soil surface for protection or improvement of the area covered. Mulching is really a nature’s idea and nature produces large quantities of mulch all the time with fallen leaves, pine needles, twigs, pieces of bark, spent flower blossoms, fallen fruit and other organic material.

Objectives of Mulching

Mulch is a protective layer of either organic or inorganic (Synthetic) material that is spread on the topsoil;

- ✓ To conserve moisture
- ✓ To maintain soil temperature
- ✓ To increase fertilizer use efficiency
- ✓ To increase plant growth and yield
- ✓ To check weed growth and keep the vegetable clean
- ✓ To stimulate micro flora in soil
- ✓ To add organic matter
- ✓ To reduce run-off and soil erosion
- ✓ To promote earlier harvest

Types of Mulching

There are mainly two type of mulching

a) Organic mulches

Organic mulches made from natural substance, add nutrients and humus to the soil after decomposing and improving soil tilth and moisture holding capacity.

b) Inorganic/Synthetic mulches

Inorganic mulches are inert materials that have not originated from living material; they do not add nutrients and humus to the soil.

Organic Mulches

1) Grass clippings

The best use of grass clipping is to leave them on the lawn. 2-inch layer of grass clipping provides good weed control. Grass clipping will decompose rapidly, adding nutrients back into the soil. The main disadvantages that thi ck layer of green grass will give off excessive heat and foul odors rather the decompose as other material, for decomposition of grass clipping we can add extra does of nitrogen fertilizer.

2) Hay and straw

6 to 8 - inch layer of hay and straw provides god annual weed control. theses material decompose quickly and must be replenished to keep down weeds. They stay in place and will improve the soil as they decay. Straw is preferred over hay. Never use the hay which contains too much of weed seed. Straw is not very ornamental and best for vegetable garden, but it improve the soil fertility.

3) Leaves

2 to 3- inch layer of leaves provides good weed control. it is best to shred the leaves coarsely, using a shredder the lawn. Oak and beech leaves help to acidify the soil for acid loving plants.

4) Pine bark

2 to 3 inch layer of pine bark is good for weed control. pine bark makes an attractive, usually dark – coloured mulch. Large pine bark nuggets float in water and may not stay in place during in heavy rain. They may also attract termites and other insect.

5) Pine needles

2- inch layer of pine needles makes as excellent mulch for acid loving trees and shrubs. This mulch is very attractive and allows water to penetrate easily.

6) Wood chips

The material contains bark and pieces of wood of various sizes and makes attractive mulch. 2 to 3 inch layer of wood chips provides good weed control. small wood chips decompose very rapidly using nitrogen from the soil, which needs to be replaced by nitrogen fertilizer. Wood chips may attract termites and other insects.

7) Compost

Composed is a very good mulch, it has fertilizer value and soil – like appearance. Finished compost (humus) is also a good organic amendment for tilling into the soil after the growing season ends.

8) Newspaper

Newspaper or paper is also used as mulch material. It is certainly readily available and economical but difficult to apply.

Inorganic Mulches

1.Gravels, Pebbles and Crushed stone

These material are permanent and are best used for permanent planting such as foundation plants. 1- inch layer of small rocks will provide good weed control.

2.Plastics

Plastic mulches have been used by commercial growers since the early 1960s, with black and clear plastics being the most popular. Plastic mulches normally are used in conjunction with drip irrigation to maintain optimum soil moisture and for improved stand establishment.

Polyethylene film provide many advantages for the user such as increase yields, earlier maturing crops, higher quality produce, insect management and weed control (Lamont,1993).

2.1 Reflective plastic mulch

Silver Black Reflective silver or aluminum mulches also give cooler soil temperatures. They tend to repel aphids, which can serve as vectors for various viral diseases. In addition to this it is recommended for strawberry (a winter crop) because it transmits enough of the incident light to the soil to enhance warming and the same time reflects 20-25% of the light back into the plants.

2.2 Infra –red transmitting (IRT) plastic mulch

It is recently developed and also known as photo – selective plastic mulch. These plastics transmit high proportion of solar infra – red radiation, while blocking most photo – synthetically active radiation. These materials warm the soil than black polyethylene mulch but less than clear plastic

mulch. Crops grown on IRT mulch become ready to harvest 7 – 10 days earlier than crops grown with black plastic mulch.

2.3 Biodegradable or Eco – friendly plastic mulch

Biodegradable plastic mulches are made primarily from plant starches and can be tilled at the end of the season, reducing labour costs for plastic removal and disposal. They can be broken down by micro-organisms in the soil such as bacteria, fungi and algae (Smith, 2008).

Prior to the onset of degradation, biodegradable plastics have a comparable level of performance to standard plastics. Breakdown is primarily affected by temperature, sunlight, moisture, soil type, crop cover and weed pressure. This means that conditions which favour good crop growth also aid in mulch breakdown. Warmth, rain and UV exposure lead to increased micro-organism activity in the soil, speeding up plastic biodegradation. Soils with high levels of organic matter also tend to have high levels of microbial activity, increasing the speed of breakdown. As the mulch begins to degrade, weeds that grow through the gaps in the mulch with stretch it out and further speed breakdown (Rangarajan, 2006). The mulch must be stored in cool, dry temperatures, since it will begin to degrade in warm or moist environments. It should be stored upright on its ends, to avoid tearing holes in the roll which will be sites of early degradation once laid. Mulch should be laid immediately before planting, since exposure to sunlight and moisture will initiate breakdown (Rangarajan and Ingall, 2006)).

2.4 Colour plastic mulch

Colour plastic mulch

A mulch's color affects the temperatures below and above the mulch through the absorption, transmission and reflection of solar energy. This affects the micro environment surrounding the plants.

Black plastic Mulch :-

Black plastic mulch is the most popular color used in commercial vegetable production, especially for weed control. As a blackbody absorber, this plastic absorbs all incident solar radiation, including visible, infrared and ultraviolet light. Much of the thermal energy, however, is lost to the atmosphere through convection and re-radiation. Transferring of thermal energy to the soil can be optimized by maximizing mulch contact with the soil (moist soil). In such a case soil temperatures under black plastic during the daytime can be as much as 5°F higher at a 2-inch depth and 3°F higher at a 4-inch depth than bare soil at the same depths .

Clear plastic Mulch:-

Clear plastic Mulch soil temperatures during the daytime under clear plastic can reach 8-14°F higher at the 2-inch depth and 6-14°F higher at the 4-inch depth than bare soil at the same depths due to a greater (85 to 95%) solar radiation transmittance. Clear plastic absorbs very little solar radiation. Water droplets that condense on the underside of clear plastic allow solar light (short-wave radiation) in, but block outgoing, long-wave infrared radiation (heat). This heat normally is lost to the atmosphere from bare soil. Incoming solar radiation, however, makes weeds a major problem under clear plastic unless controlled with a herbicide or fumigant or other means. Solarization or disinfecting of the soil has been used in some areas of the country to reduce soil borne diseases and some weeds.

Red/ Brown (red/slt) Red plastic mulch

Red/ Brown (red/slt) Red plastic mulch has been shown to increase tomato yields and quality in some trials and reduce the severity of early blight in others. It also has been shown to increase yields of honeydews, muskmelons and zucchini. In addition, it has been shown to significantly increase soil temperatures. Tomatoes that were grown over red plastic had larger shoots and smaller roots than plants grown over other colored plastic such as white or black. Since the plastic keeps the soil moist and protected, a slightly smaller root would not harm the plant. For tomatoes, using the red colored mulch gave a 20% increase in the first harvest of tomatoes. This is important to farmers because the first fruit of the season can bring in the most money.

Other colors plastic mulch:-

Yellow, orange, blue and gray plastic mulches also have been evaluated. The different radiation patterns that are reflected back into the canopies of various crops from these mulches affect plant growth and development in different ways. Some colors like yellow attract certain insects like green pea aphids and cucumber beetles. Such mulches might be used in a field to grow “catch crops” to pull insects away from other crops. Blue-colored mulches have been shown to increase zucchini and honeydew yields. More research needs to be conducted to determine the effects of these colors on plant growth, yields, earliness and pest resistance.

These mulches selectively absorb photo-synthetically active radiation (PAR), while transmitting solar infrared radiation. Also called infrared-transmitting (IRT) mulches, they control weeds and exhibit improved soil-warming characteristics, although generally not as well as clear plastic but much more than black mulch. There are two types of selective wavelength weed suppressing mulches(Not black) one has a brown colour called Al OR and the other is green. It is good mulch for no weeds soil warming. Mostly suited for winter crops. It is obvious that mulching can do wonders in modern agriculture and this is a tool for the 2nd green revolution into India.

Advantages of Mulching

- ✓ Earlier harvest (Precocity)
- ✓ Reduced evaporation
- ✓ Reduced weed problems
- ✓ Reduced fertilizer leaching
- ✓ Reduces soil compaction
- ✓ Eliminate root pruning (Better microclimate in the root zone)
- ✓ Cleaner produce
- ✓ Helps in insect management
- ✓ Improved quality.
- ✓ Increased yield